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**Garden-Based Learning in Worcester, Massachusetts:
Addressing Science and Health Curriculum Gaps through Summer Youth
Programming**

Julia Groenfeldt

A MASTERS RESEARCH PAPER

Submitted to the faculty of Clark University, Worcester, Massachusetts in partial
fulfillment of the requirement for the degree of Arts in the department of Community
Development and Planning

And accepted on the recommendation of

Laurie Ross, Chief Instructor

Nigel Brissett, Second Reader

Abstract

This research examines the role of experiential garden-based “food citizenship” education to improving school year health and science curriculum retention and to further influence broader social and environmental awareness. Studies demonstrate the importance of these educational models to teach children the processes of food production to consumption. Through new knowledge on food systems education, children will learn to become more mindful and conscious consumers that will ultimately impact personal health outcomes as well as broader global sustainability. Education is a key component to the emerging alternative food network (AFN) that is challenging the modern agro-industrial food system. This research provides a contextual framework for developing an educational program for the South Worcester Neighborhood Improvement Center’s (SWNIC) five-week summer youth program for low-income youth in Worcester, MA. This program has been developed inline with Massachusetts’s science and health curriculum standards to improve summer education, reduce summer learning loss, and contribute to food citizenship education for Worcester youth. This program draws on research regarding the current food system, changing food systems models, and educational tools to advance more sustainable alternative food systems. Through the application of the Nuestro Huerto Education Program at the SWNIC, Worcester youth will receive garden-based learning that will ultimately contribute to improved educational outcomes and positive health and environmental awareness.

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Introduction

Today's young people are, as we've seen, growing up in America's third frontier. This frontier has yet to completely form, but we do know the general characteristics. Among them: detachment from the source of food, the virtual disappearance of the farm family, the end of biological absolutes, an ambivalent new relationship between humans and other animals, new suburbs shrinking open space, and so on. In this time of quickening change, could we enable another frontier to be born—ahead of schedule?

Richard Louv, *Last Child in the Woods: Saving our Children from Nature-Deficit Disorder*, p. 230

Many environmental and social health problems are the direct consequences of the negative externalities of current agriculture production methods and consumer habits. This paper discusses the importance of food systems education, specifically through garden-based experiential learning, in improving science and health comprehension to facilitate positive environmental and social health perspectives. This research provides background literature to support the implementation of a garden education summer program that will be integrated as a component of the South Worcester Neighborhood Improvement Center's (SWNIC) 2016 summer youth program. This educational program will provide students with necessary tools and resource to better understand the current agriculture system through direct experience producing and consuming sustainable and healthy food that many low-income communities, such as the South Worcester neighborhood, are unable to access due to broader social and political forces.

Since the 1980s, the US food system has seen a gradual yet substantial rectification and transformation as social, political, and environmental forces have pushed for a 'new food equation,' (Morgan 2009) also refereed to as the "dominant food movement (Alkon & Agyeman, 2011) or 'alternative food networks' (AFNs) (Jarosz, 2008). While the

bourgeoning of the environmental movement initiated concerns over unsustainable agro industrial externalities, AFNs were further influenced by unsustainable rapid urbanization, global food insecurity, land use conflict, and a revaluation of post productivism mentality. Large-scale production of monocultures and agro- industrial farming systems were developed as the dominant capitalist market structure that pushes for efficiency and productivity through Fordist production mechanisms. Production was further expanded through a push to develop rural agriculture systems separate from urban centers (Marsden & Sonnino, 2012). Planners and policy makers reinforced this separation through what Karl Marx referred to as an “irreparable rift in the interdependent processes of social metabolism.” John Belemy Foster later referred to this concept as a “metabolic rift” to represent the severe disconnect between humans and the environment, specifically agricultural systems (Foster, 1999).

Concerns over sustainability and food security have evolved in response to the current environmental, political, and social climate that questions the dominant agricultural system. While food security has often been used as a response to undernourishment in the global south, the term “food justice” has emerged to address growing concerns over insufficient healthy or sustainable food access in western countries. This term, while somewhat broad, seeks to represent the larger problems of the current food system:

The challenge for food movements is to address the immediate problems of hunger, malnutrition, food insecurity and environmental degradation, while working steadily towards the structural changes needed to turn sustainable, equitable and democratic food systems into the norm rather than a collection of projects (Holt-Giménez, 2010, p. 4).

Food justice initiatives have been spearheaded by NGOs, politicians, planners, community groups, and individuals who advocate for a changing food scape and reformed AFN (Cadieux & Slocum, 2015). Food justice is a broad term that can refer to various avenues within AFNs. Therefore, while AFNs have been defined as 1) reducing distance between producer and consumer, 2) reconstructing large-scale industrial farming to small-scale sustainable practices, 3) increasing sustainable food markets and food access, and 4) focusing commitments to social, economic, and environmental initiatives of food, food justice work can be incorporated into various avenues within these wider fields (Jarosz, 2008).

AFNs and food justice movements have incorporated place-based solutions to redesign the current food scape and reincorporate food into the urban environment. This has been seen through the rise of urban agriculture and local food production that seeks to bridge the distance between producer and consumer, rural and urban. The rise in national food policy councils demonstrates this commitment to incorporating AFNs into the urban planning agenda that seeks to facilitate healthy food access and general food awareness as a community development strategy (Morgan, 2009). The city of Worcester has similarly incorporated the Worcester Food and Active Living Policy Council that seeks to incorporate a food justice agenda to influence a positive community environment. Additionally, organizations and political agencies have collaborated to facilitate the development of the Worcester Regional Food Hub that seeks to expand access to healthy food by supporting food production, distribution, and consumption in the Worcester region. These initiatives seek to expand the AFN through economic development and food

justice initiatives that are crucial to facilitating a sustainable and food secure urban environment, specifically within low income and food insecure neighborhoods (Worcester Food & Active Living Policy Council, 2014; Hfcm.org, 2016).

Cultivating Informed Food Citizenship

Food education has been a significant component to national AFNs and food justice initiatives as organizations and institutions seek to inform citizens of the social and environmental consequences of their personal food choices. Jennifer Wilkins (2005) uses the term “food citizenship” to refer to the practice of food related endeavors that support politically, socially, economically, and environmentally sustainable food systems. Wilkins writes:

The promise of a new food system rests as much on reforming the existing system as on becoming food citizens. As new food systems emerge, as they surely have through the kind of work done by members of our two societies, it will be the food citizens who will sustain a socially just, equitable, and environmentally regenerative food system for generations to come (Wilkins, 2005, p. 272).

According to Wilkins, the concept of food citizenship has been threatened by the current unsustainable food system, national food policy, local and institutional food policy, and inadequate and uninformative health and nutrition organizations. In order to positively promote food citizenship, students must receive adequate food education to inform both consumers and producers of the impact of food choices and food cultures on the broader food system. Our current food choices and behaviors have been significantly skewed by uninformative and limited food systems knowledge that prevent one from developing the skills and resources to make informed food decisions that support physical health, social systems, and environmental sustainability (Wilkins, 2005).

Food Citizenship for Worcester Youth

While education is a key intervention point that can mitigate many health, nutrition, and environmental problems associated with the current agro-industrial food system, public school education does not prioritize food citizenship as component of current school curriculum. Science and health curriculum does address some general food citizenship topics; however, food systems are not addressed through cohesive or comprehensive food studies curriculum. In an effort to address these education gaps, I have developed a five-week summer program curriculum for low-income youth in South Worcester that teaches food citizenship through hands-on garden-based learning experience. This program has been developed for the Nuestro Huerto Education Program that provides garden-based learning experience to youth at the SWNIC summer camp program. In developing the garden curriculum, I have identified food studies curriculum gaps in Worcester Public School science and health based curriculum. The purpose of this curriculum is to address these curriculum gaps thorough extended summer programing that reinforces school year health and science curriculum while providing hands-on experiential food citizenship education. The paper includes research on current curriculum standards, identify curriculum gaps, examine other successful garden based educational programs, and propose standards for garden-based curriculum for the SWNIC youth. This program provides a space for Worcester youth to gain further skills and knowledge in food and health education. While this program was developed for the SWNIC, this curriculum can potentially be used for other garden based after-school and summer programs. Ultimately WPS science and health curriculum should implement hands-on garden-based food

education; however, this project will specifically focus on intervention points through extracurricular activities and not through broader school year curriculum changes.

Nuestro Huerto

Nuestro Huerto is a small urban farm that works to provide food access and food education to residents of the Main South and South Worcester neighborhoods. The farm was founded in 2009 as a small community initiative to grow healthy local food in raised garden beds. The farm now occupies over a quarter acre of land owned by the local Iglesia Casa de Oracion (House of Prayer Church) that provides free and continued use of this land for the Nuestro Huerto project. While Nuestro Huerto's original mission was to grow food to donate to the community, Nuestro Huerto has altered its business structure to include a Community Supported Agriculture (CSA) membership program to support some of their financial needs. This provides opportunities for community members to work on the farm in exchange for a reduced cost CSA share. The farm remains committed to their philanthropic mission and donates produce to Jeremiah's Inn, a local housing recovery and food pantry organization in Main South. Nuestro Huerto exists as a component of the broader community organization Worcester Roots Project, which acts as a network of community practitioners and organizations throughout Worcester.

Summer Youth Education Program

In 2014, Nuestro Huerto founded the Camp Street Community Garden, which provides community members with access to garden plots, urban agriculture education workshops, and youth garden-based learning opportunities. Nuestro Huerto has collaborated with SWNIC, which is located next to the Camp Street Community Garden,

to provide garden programming at the SWNIC's free summer youth program for low-income youth in the neighborhood. The SWNIC is a community development corporation that provides education training, employment services, housing assistance, health and food assistance, and family social services to residents in the Main South and South Worcester areas.

The SWNIC summer program runs Monday through Friday for five weeks between July and August each summer. The program provides 50 participants ages six to eleven with free breakfast and lunch each day as well as both recreational and academically based activities. The youth arrive at the SWNIC at 9 AM each morning. After eating breakfast the youth break up into age groups (six-seven year olds, eight-nine year olds, and ten-eleven year olds). These groups rotate through different activities throughout the morning. Each day, two of the groups will work in the garden while the other groups play outside or work on an activity in the SWNIC facility. Participants receive a mid day lunch and an hour of afternoon programming before ending the day at 1 PM. While the counselors provide the majority of the day's programming and activities, one day a week the UMass Extension Nutrition Education Program provides SWNIC participants with a health education class that focuses on food preparation and healthy diet choices. Nuestro Huerto has collaborated with the SWNIC program as well as the UMass program to provide youth participants with garden-based programming at the Camp Street Community Garden. The Nuestro Huerto Garden Education Program seeks to provide hands on garden to provide SWNIC youth with new knowledge on food systems, plant growth, environmental awareness, and nutrition education. While working to improve this existing program and further our food

citizenship education, the new 2016 curriculum framework seeks to address food citizenship in line with Massachusetts' school-year curriculum that more appropriately addresses health and science food citizenship garden-based education.

Summary

This research has identified key gaps in food education within Worcester Public School science and health curriculum that limits youth understanding of food systems and food citizenship. The metabolic rift has been further enforced through the lack of educational opportunities to understand issues of our current food systems. Urban youth have been unable to obtain food citizenship due to political, economic, and environmental forces that have historically forced agriculture away from urban centers. The rise of AFNs have challenged these systems as a broader societal movement demands for greater transparency and access to healthy, affordable, and local food options. Urban agriculture has been an important strategy to enhancing the AFN, as small-scale community production seeks to challenge the current agro-industrial system. Through the incorporation of urban agriculture along with food education opportunities, society has begun to shift the disconnected and unsustainable agricultural system. This research provides a background on food citizenship education in order to establish a practical application for teaching Worcester youth about food systems and food education through hands-on garden-based education. This curriculum has been developed in-line with current science and health curriculum standards that can be readdressed through continued summer education through a food systems approach. This curriculum works to extend and improve the AFN by cultivating and enhancing food citizenship through a transformation of more abstract

concepts of food and agriculture as well as environmental change through applied urban agricultural practices.

Cultivating Food Citizenship in the Garden

Literature Review:

Social and Environmental Health Intervention

The importance of food citizenship education rests in the current agriculture crisis that has resulted in socially unjust, environmentally unsustainable, and inequitable access to healthy and affordable foods. This educational platform would enable citizens to fully understand the environmental and social outcomes of food production, distribution, and consumption (Wilkins, 2005; Marsden & Sonnino, 2012). Food citizenship curriculum would thus encourage improved environmental understanding as well as personal knowledge on food choices and healthy eating habits. While each is a necessary component to broader food citizenship education, the latter has been a key argument in introducing food based educational opportunities. National food insecurity is a combination of insufficient access to healthy food as well as an overabundance of unhealthy junk food thus resulting in the growing health and obesity crisis. While childhood obesity rates have decreased among higher socio-economic households, childhood obesity rates among low-socioeconomic households have continued to increase. Rising obesity rates among low-income children are associated with lack of access to affordable healthy food and an overabundance of cheap processed food (Frederick, Snellman & Putnam, 2014). In addition, high calorie intake, lack of physical activity, and

targeted junk food media have contributed to the national obesity epidemic. Within the last decade, school based efforts to reduce childhood obesity and food education have risen to national agenda through the Let's Move! Campaign and the Farm-to-School network. These initiatives seek to address environmental and social health problems associated with the current food system through key intervention and strategies within AFNs. However, while school based intervention has proven effective, these programs are severely lacking, specifically among low-income schools. Story, Nanney & Schwartz, 2009).

Hands-on Learning

Studies show the importance of “learning by doing” as a positive and necessary means of hands-on experience based education. While many teachers agree that this type of learning produces positive results, teachers and schools often fail to provide adequate hands-on experience due to limited time and resources. As Martinez and Stager write:

The past few decades have been a dark time in many schools. Emphasis on high-stakes standardized testing, teaching to the test, de-professionalizing teachers, and depending on data rather than teacher expertise has created classrooms that are increasingly devoid of play, rich materials, and the time to do projects. (Martinez & Stager, 2013, p. 1).

While doing-based learning is often neglected due to curriculum and resource constraints, teachers and researchers agree that these opportunities produce positive results and more effective learning. A study on the effects of learning by doing for statistical thinking training showed the positive effects of this more practical experience that improved overall understanding of the material (Sedlmeier, 2000). Hussain and Akhtar (2013). conducted a study on eighth grade science learning among students in a low-income school in Pakistan. Results of this study showed higher achievement from students engaged in experimental

and hands-on science activities as opposed to students in a more traditional learning environment. This study shows the impact of hands-on science education, specifically among low-income schools that have limited access to expensive science equipment.

Experiential Learning Theory

Twentieth century philosophers John Dewey, Kurt Lewin and Jean Piaget founded the concept of experimental learning theory (ELT). This theory is based on the concepts of action/reflection and experience/abstraction that are fundamental components to holistic and comprehensive learning in the physical environment (Kolb & Kolb, 2009). John

Dewey wrote:

The fundamental factors in the educative process are an immature, underdeveloped being; and certain social aims, meanings, values incarnate in the matured experience of the adult. The educative process is the due interaction of these forces. Such a conception of each in relation to the other as facilitates completest and freest interaction is the essence of educational theory (John Dewey, 2006, p. 97).

While John Dewey and other scholars proposed ELT as a key component of standard school learning that would improve student's learning experience; however, this theory proposes broader science education changes that cannot be achieved by simply providing students with more hands-on work or field trips. According to Dewey, this type of science learning must actively provide students with a process of understanding so the students themselves can act in the experience as a larger dramatic and artistic experience.

Therefore, the students must see the experience as an action from start to completion and they must recognize the significance of the completed act or experience (Wong & Pugh, 2001). According to Dewey, we as students are within the experience through an applied mental state that brings the learner into the experience through justified and explained

processes of science and nature. Dewey advocated for this philosophy of education to be applied to current educational framework. Instead of rejecting traditional education, Dewey advocated for current educators to incorporate these standards into current practices for a more comprehensive learning and experience based learning environment (Khasawneh, Miqdadi & Hijazi, 2014).

Place-Based Education

In a review of *Science Education* by Champagne and Klopfer (1977), these authors identify current science education's failure to apply Deweyan principles of experience-based education. These authors attribute this failure to Dewey's somewhat abstract and difficult to understand concepts of experience and education philosophy and the lack of value associated with scientific reasoning and experience based-science education in current education curriculum (Wong & Pugh, 2000). While experience-based learning has not been adequately adopted into current education standards, in recent years experience based environmental education has gained momentum within alternative primary and secondary education programs. In the 1990s, the term "place-based learning" emerged as an approach to incorporate student learning in the local environment (Semken, 2012).

Called place-based education, its proponents have been striving to make the boundaries between schools and their environs more permeable by directing at least part of students' school experiences to local phenomena ranging from culture and politics to environmental concerns and the economy (Smith, 2007, p. 190).

While place-based learning is a version of environmental education, place-based learning focuses on both environmental and social aspects of the local environment. Place-based learning uses experience-based and hands-on practices to incorporate lessons into

ecological and socially minded learning experiences. Place-based education arose as an initiative to strengthen rural schools through a focus on the local environment and community based education. While place-based education is by no means the norm, this form of education has proliferated as a key education strategy used by various primary, secondary, and university education systems. Studies show the importance of this type of education in developing an understanding of cultural, historical, and regional community perspectives that are often excluded from traditional school curriculum (Smith, 2007; Powers, 2004).

Garden-Based Learning

The development of place-based education was simultaneously reinforced through the rise of the national garden education and school garden movement. The last twenty years has seen a substantial increase in school garden programs and integrated garden curriculum. School garden curriculum has been encouraged by national and statewide policy to promote garden-based education. Garden-based learning and place based learning go hand-in-hand as schools and youth programs attempt to address community dynamics through educational opportunities addressing local land, food systems, and natural environments (Blair, 2009). Studies show the important significance of these programs in promoting social and environmental understanding through a more tactile and hands-on Deweyan educational approaches. In evaluating the effects of school garden programs, Emily Ozer writes:

School garden programs differ, but all have experiential education activities that are taught in a growing environment and some adult(s) who supports the students' learning in the growing environment. A social ecological-transactional perspective of human development views the child as nested within immediate contexts or

micro-systems (e.g., school, family, community) that reciprocally interact with each other and the child over time to shape development (Ozer, 2006, p. 851).

Farm-to-school programing supports experiential learning through connections between farms and schools to both provide students with local food in the cafeteria as well as educate students on social and environmental issues related to the food system. Educational opportunities include farm field trips, farmer visits to the classroom, and school garden participation, which provides students with experience-based educational opportunities on food and agriculture related issue. While the farm-to-school movement encompasses broader political, nonprofit, and school-based initiatives to improve food education in schools, garden-based learning has also been widely supported through after-school and summer educational opportunities that correspond with the farm-to-school initiative to promote food and agriculture education through hands-on garden experience. The following section will examine the benefits of garden-based learning to improving student performance, cultivating healthy eating habits, fostering environmental awareness, and promoting local agricultural systems (Vallianatos, Gottlieb & Haase, 2004).

Health Education

Health and nutrition education have been focal points of both farm-to-school and other garden-based educational programs. Rising childhood obesity rates and the overabundance of junk food and fast food consumption call for creative nutrition intervention to teach children of the importance of healthy diets and proper nutrition. School districts throughout California have implemented farm-to-school programing in hopes of decreasing obesity rates and improving food education opportunities. The Davis

Join Unified School District (DJUSD) is a key example of successfully incorporating agriculture education into the school environment. This program provided comprehensive agriculture education by incorporating school gardens, farm tours, and agriculture classroom curriculum, nutrition and salad bars into DJUSD schools. These components provided broader student understanding of the agriculture system from production to distribution to consumption which thus provided students with a more thorough understanding of the social and environmental impacts of food. Results of this program showed improved student diets and improved perceptions and understanding of healthy eating and healthy food options (Graham, Feenstra, Evans & Zidenberg-Cherr, 2004).

A study by McAleese et al. identified the positive results of school garden programs on student fruit and vegetable consumption. According to this study, students who had participated in a garden program consumed more fruits and vegetables than students in the control group. Additionally, garden program participants showed much higher intake of vitamin A, vitamin C, and fiber (McAleese & Rankin, 2007). Similarly, an analysis of a second grade school gardening program showed significantly higher nutrition knowledge among students who participated in a garden-based program as opposed to students participating in a regular classroom based program. Additionally garden participants were more likely to choose to consume vegetables in the cafeteria as opposed to non-garden participants. This study showed the positive effects of implementing nutrition education and garden-based programming to incorporate more effective food and nutrition education. The authors write, “although nutrition education alone does seem to improve fruit and vegetable knowledge and preference in children, adding the gardening

component appears to strengthen the likelihood that children will increase vegetable intake (Parmer, Salisbury-Glennon, Shannon & Struempler, 2009).

Environmental Education

Garden-based learning extends beyond the scope of health and nutrition education to incorporate broader environmental awareness and ecological accountability. Results of the Project GREEN school garden research study showed improved environmental awareness and attitudes among students who participated in garden based school programs. The study was conducted with seven elementary schools in Texas and Kansas who participated in a set garden program developed by Project GREEN for the purpose of the study. Overall results showed the positive effects of these programs in promoting ecological concern and environmental understanding through experimental garden-based learning and experiential education (Waliczek & Zajicek, 1999). Programs like Project Green provide students with the opportunity to explore nature outside and in the garden where learning opportunities extend beyond the confined classroom environment. Blair (2009) writes of the importance of using school gardens as mechanisms for furthering environmental education and awareness through direct experience based learning opportunities. Blair writes:

Gardens adhering to the principles of biodiversity and organic pest management—containing ponds or recycling streams, trees, and butterfly attractors—would be havens for a wide variety of flora and fauna beyond the crops, flowers, and bushes purposely grown and would demonstrate ecosystem complexity (Blair, 2009, p. 17)

Garden-based education and farm-to-school programs have similarly promoted environmental awareness through broader recognition of community food systems and

AFNs. These lessons are incorporated into experience-based garden learning through discussion of community land, agriculture and food networks, local and sustainable food options, and social and economic justice of food systems. These topics can be addressed through direct garden-participation and agriculture education that teaches children their role as both a producer and consumer in the broader food network. Education will thus inspire students to connect with their environment through the food system as well as learn to produce food through sustainable mechanisms. Additionally, schools themselves have the ability to further promote environmental awareness and local food systems knowledge through direct purchasing power.

On the agricultural side of the equation, farm-to-school programs can support farmers and local agriculture, contributing to farmland preservation efforts. School districts are a potentially significant market for local farmers, especially those engaged in urban-edge agriculture. Because farm-to-school programs boost farm incomes and teach urban constituents to value farming as a good in itself, farm-to-school connections represent the kind of anti-sprawl efforts that open-space advocates and farmers can jointly embrace (Vallianatos, Gottlieb & Haase, 2004, p. 421).

The farm-to-school movement focuses equally on local food purchasing and local cafeteria options as well as food education and food systems knowledge through garden-based learning. School purchasing will both promote local food systems as well as improve student awareness on the benefits of improving local food economies and supporting local food systems ((Vallianatos, Gottlieb & Haase, 2004).

Limitations of Farm-to-School Programing

While studies demonstrate the importance of garden-based education in improving health and science education, schools are often unable to incorporate these lessons into

standard school curriculum. Lack of resources or experienced garden teachers have limited farm-to-school programming. While studies show the positive effects of this type of programming on overall academic performance, specifically among health and science education (Blair 2010; Graham et al. 2004), garden-based programming remains the exception and not the norm. Throughout the past few years this type of programming has been increasing in both public and private schools; however, current curriculum limitations and lack of adequate resources continue to limit these opportunities. A study on the impact and use of school gardens in Florida elementary schools demonstrated that teachers used school gardens infrequently and lacked resources or experience to use the garden for educational purposes. Additionally, teachers mainly used the school gardens for environmental education and failed to incorporate garden programming into broader academic lessons (Skelly & Bradley, 2000). Results of this study show the difficulties in incorporating garden-based programming into everyday school curriculum. Blair (2009) writes:

The very qualities that render school gardening a potent and multidimensional experiential learning experience-being outdoors and involved in hands-in-dirt digging, planting, and cleanup may render it unpopular with teachers who prefer the safety, predictability, cleanliness, and ease of the indoor classroom (p. 20).

Garden programs require adequate support and resources from schools and administration in order to properly incorporate these lessons into existing curriculum; however, due to funding constraints and general inability or difficulties to incorporate the garden have severely limited the extent of these programs.

Worcester has introduced farm-to-school programing in various public schools around the city. These programs have been led by organizations and initiatives such as the Worcester Kindergarten initiative and the Regional Environmental Council (REC) that have worked to incorporate farm-to-school programs in school-year curriculum. The REC provides schools with garden workshops for participating teachers, garden curriculum resources, seeds, and other garden resources to facilitate garden activities and use. Participating schools are required to help implement the garden and provide necessary maintenance and upkeep (recworchester, 2016). The introduction of farm to school programing has also helped increase local purchasing for school food in Massachusetts. Massachusetts legally requires state agencies to purchase local produce that is not more than 10% more expensive than non-local (not state purchased) food items. However, unlike some states, Massachusetts does not require target laws that would set legal requirements for the amount of local food products purchased. For example, Illinois' local food procurement targets mandate 20% local food purchased by 2020. Increasing legal participation to improve local food procurement will simultaneously improve farm to school initiatives that seek to implement local and sustainable food participation through farm to classroom and farm to cafeteria programs (Harvard Food Law and Policy Clinic, 2013).

Extracurricular Learning

Hands-on experimental learning is an important component to school curriculum and learning outcomes; however, as previously discussed, these opportunities are often difficult to implement within existing curriculum structure. Barriers to this type of

education reform have been addressed through extended after-school and summer programs that work to address outdoor experiential education and hands-on learning outside of the standard school structure. These programs have been particularly helpful in providing students with resources and opportunities to expand their education beyond the classroom through real world experiences and innovative programming that is not always possible within standard school curriculum. Additionally, these programs often attempt to address low-performing and low-achieving students through supplemental education opportunities. Summer programs have been particularly beneficial in reducing summer learning loss. A meta-analysis on post summer vacation student test scores indicated that the average student lost one month of their education during the three-month summer vacation (Cooper, Nye, Charlton, Lindsay & Greathouse, 1996; Cooper, Charlton, Valentine & Muhlenbruck, 2000; Donohue & Miller, 2008)

Summer learning loss results are exacerbated among low income and minority students. A study on the effects of summer learning loss on low socioeconomic students shows the cumulative effects of the achievement gap on long-term education outcomes. Ultimately, two-thirds of the achievement gap among low-income high school students can be attributed to summer learning loss (Alexander, Entwisle & Olson, 2007). Summer learning disparities are associated with parent's ability to provide supplementary afterschool and summer education for their children. Alexander et al. writes:

The school curriculum in the elementary years often is self-consciously pursued at home, as when, for example, parents work with their children on letter and number skills or reading.... For their part, poor parents often themselves struggled at school and have low literacy levels, and thus they undoubtedly have difficulties cultivating valued educational skills in their children. While low income, low SES parents

generally want the same kinds of enriching experiences for their children as do well-off parents, they often lack the means to provide them (p. 176).

Therefore, summer programs and summer education opportunities are an important opportunity for students of all socioeconomic statuses to obtain extended educational opportunities and experiences that many students lack during the summer months.

The benefits of summer programs in reducing summer learning loss are highly dependent on the structure and situation of the specific summer program. Smaller class sizes are necessary to provide students with individual attention and differentiated instruction that is not often possible with larger classes (Cooper, Charlton, Valentine & Muhlenbruck, 2000). Experts have identified the need for programs that accelerate learning through enriching opportunities and programs (Bell & Carrillo, 2007; Boss & Railsback, 2002). Effective programs require active participation throughout the program that can be difficult in noncompulsory summer programs. Program participation is significantly higher with the addition of active parental participation as parental figures promote attendance in programs outside regular school requirements (Borman & Benson, 2005). Programs require effective evaluation and results to identify key target areas and improve existing program structure. Additionally, research shows the importance of aligning school-year curriculum to either reiterate lessons from the prior grade or to provide students with a preview of what they will be learning the following school year (Boss & Railsback, 2002; McCombs, Augustine & Schwartz, 2011).

Summer Education in the Garden

The burgeoning of the farm-to-school movement through the past few decades has simultaneously lead to an increase in summer garden-based education programs including summer school and day camp programs. Studies demonstrate the importance of these programs in addressing summer learning loss and improving health and science education through informal programing and experimental learning opportunities. A study of an inner-city youth garden program demonstrated the importance of informal learning to address science education through hands-on experience that is typically not addressed through traditional school science curriculum.

For these city dwellers, the scientific method studied in school gave them few clues about the workings of the world in which they live. The gardening program taught them an appreciation of the environment and an understanding of the cycle of food in an authentic manner, and therefore informal education programs at the community level have an important role to play in the lives of many youth (Rahm 2002, p. 180).

Summer garden-based education programs seek to influence children's nutrition knowledge through diet intervention and improved understanding of the importance of healthy eating habits, similar to many farm-to-school garden lesson objectives. Studies have measured the outcomes of summer garden programs on health and nutrition knowledge. After participating in summer gardening programs, results indicated improved overall nutritional attitudes towards fruits and vegetables and increased consumption of fruits and vegetables (Koch, Waliczek & Zajicek, 2006; Heim, Stang & Ireland, 2009). While summer programs must incorporate best practices through smaller class sizes and differentiated instruction (Cooper, Charlton, Valentine & Muhlenbruck, 2000), accelerated

learning (Bell and Carrillo 2007; Boss et al. 2002), parent and student participation (Borman & Benson, 2005), program evaluation, and summer and school-year curriculum alignment (Boss & Railsback, 2002), research demonstrations the success of summer garden based learning in curbing summer learning loss and enhancing science and health education through experimental and innovative educational programming.

Summary

Social and environmental health intervention through garden-based education has risen in popularity among the farm-to-school movement and other youth education programs. John Dewey's experimental learning theory and the more recent application of place-based learning brought new movement of practical and experience-based learning objectives that incorporates both ecological priorities and community-based environmental awareness. These objectives have been integrated into garden-based learning that aims to address science and health education through more practical, hands-on learning opportunities. While the benefits of garden-based learning are evident, school-curriculum is often limited in its ability to implement these innovative and experiential learning opportunities. Extracurricular and summer programs have thus begun to incorporate garden-based learning as strategy to both curb summer learning loss and improve student learning standards in health and science education. These programs provide students with opportunities to further their understanding of ecological impacts of food production and health impacts of food consumption. These lessons provide children with broader understanding of the complete food system as a means of incorporating new food

citizenship education to expand food justice initiatives within rising alternative food networks.

Experimental Learning in Worcester

Methodology:

Background

While working as the Garden Educator in the summer of 2015, I gained insight and experience working with the program and developing program curriculum. The program began in 2014, and each summer the Garden Educator would develop a new curriculum based on that person's experience or desired program outline. While this curriculum worked for the past few years, there was little structure or clear understanding of what the curriculum should look like or how to build or develop past year's curriculum. These limitations ultimately brought me to develop a structured garden curriculum that can be used for future summer programs with the SWNIC and possibly further extension programs. While working for Nuestro Huerto this past year, I have developed a structured five-week garden curriculum that incorporates Worcester Public School science and health curriculums standards so that the Nuestro Huerto Education Program can prepare students with summer curriculum aligned with school-year curriculum. This curriculum has been organized into a resource book for Nuestro Huerto and Nuestro Huerto's future Garden Educator staff working with SWNIC summer program. In the following section, I will discuss my methods and process for developing this curriculum.

Curriculum Development Matrix

The garden curriculum was developed inline with Massachusetts Science and Technology/Engineering Curriculum Framework and Massachusetts Comprehensive Health Curriculum Framework (See Figure 1 and Figure 2). While developing the garden curriculum I developed a matrix for understanding where Massachusetts health and science curriculum addresses topics that can be incorporated into garden-based learning opportunities (See Figure 3 and Figure 4). Within the curriculum frameworks, each topic is given a proposed activity for further student learning. While many of these topics address potential food citizenship topics, hands-on gardening is not mentioned as a proposed learning activity in the current health and science curriculum standard. The matrix thus proposes possible garden-extension activities inline with the current learning extension. In developing the summer curriculum, I included these learning areas and the garden-learning extension as summer program activities that reiterates or reinforces many of the topics studied in the school-year curriculum.

External Garden Curriculum Resources

While working as the 2015 Garden Educator and while developing the new garden curriculum, I integrated existing curriculum from external garden education resources as well as independently developed garden material specifically designed for the SWNIC program. The significant increase in garden programs through the farm-to-school movement and additional organization's efforts has lead to a simultaneous increase in garden-education curriculum resources to facilitate this growing movement. The National Farm to School Network. Life Lab, The Edible Schoolyard Project, Kids Gardening,

Denver Urban Garden, Slow Food USA, Let's Move, Growing Minds, Food Hub, and more offer curriculum resources to help teachers and educators introduce youth to hands-on garden activities. These resources provided me with valuable material for the Nuestro Huerto Education Program. Due to various program specifics such as the program length, program location and seasonal differences and participant age group, this material has been adjusted to fit this specific program and appropriately meet the needs of the SWNIC youth.

Participant Observation and Program Material

Working with the youth throughout the 2015 five-week summer program, I gained insight and experience working with the participants, discussing the material, and observing how participants engaged in the activities. Observations were also reflected through the participant's daily journal entries and reflections on the day's activity (See Figure 5). These journals were used as both a guide for the youth as well as a guide for the Garden Educators who could observe how well the students were engaging, enjoying, and learning from the day's material. Journal prompts were given at the end of each lesson as the educators instructed the students to discuss topics such as, "What are three things plants need to grow?" or "Name three things growing in the garden." These prompts would vary depending on the week's theme or the specific lesson that day. Participants would draw pictures, list plants, identify plant parts, list plant nutrients, or write sentences on what they had done in the garden that day.

Results:

Throughout the past year, I have compiled my research and experiential observations into the finalized Nuestro Huerto Education Curriculum Framework. This

material is a compilation of research on Massachusetts's science and health curriculum food education and food citizenship learning gaps, independent and comparative garden-programing curriculum materials, and personal experience participating in the 2015 summer program. These materials and experiences have lead me to produce the finalized curriculum framework that will be used for the 2016 summer program as well as all previous Nuestro Huerto educational programing with the SWNIC (See Figure 2.).

The five-week curriculum is structured around week-by-week themes that provide the participants with three lessons each week that address both scientific processes of agriculture production as well as nutrition and health lessons (See Figure 1):

- Week 1: Introduction to the Garden teaches participants about the community garden, basics of plant growth and plant parts, and fundamentals of planting in the garden beds. This week's lessons include: What's Growing in the Garden, From Seed to Stem, and Planting Our Community Garden.
- Week 2: What Plants Need to Grow looks at soil nutrients, how insects impact the garden, and general garden care such as watering, weeding, and plant protection methods. This week's lessons include Soil and Compost, Bed Bugs, and Helping Our Plants Grow.
- Week 3: Community Land and Space explores the social and environmental history of Worcester and the broader agriculture region. This week's lessons include Exploring Our Regions History, Gardening in an Urban Environment, and Community Engagement and Environmental Stewardship.
- Week 4: Understanding Agriculture Systems examines the broader agricultural industry and different types of farming and gardening throughout the world. This week's lessons include Local and Regional Agriculture Systems, Visit to Nuestro Huerto Farm, and Connecting the Food System.
- Week 5: Harvesting for Health provides participants with the opportunity to cook with the food they planted in the first week. This week's lessons include Harvest Salad, Super Green Smoothies, and Growth for a Health Planet + Healthy Bodies. Each of these lessons is used to provide a holistic approach to food citizenship education that will show participants the interconnected

components of the broader food system and the importance of sustainable production for global, social and environmental health.

Background literature on the positive benefits of garden-based experiential education supports this program structure and points to the importance of developing food citizenship. Previously cited literature identifies the negative externalities of the current agro industrial food system that has progressed into broader food systems changes through AFNs. This transformation is the direct result of both consumers and producers demanding a more equitable and sustainable food system that facilitates ecologically sound food production and improved access and understanding of healthy food choices (Jarosz, 2008; Marsden & Sonnino, 2012; Holt-Giménez, 2010; Morgan, 2009). This progress is reinforced through conscious consumer behavior that promotes a deeper connection between historically fragmented rural agricultural regions and urban centers. Food citizenship education is a tool to facilitate the progress of AFNs. Garden-based experiential learning is a beneficial tool to teach food citizenship and improve environmental and social health consciousness outside the traditional classroom structure (Wilkins, 2005; Ozer, 2006; Blair, 2009; Vallianatos, Gottlieb & Haase, 2004). This curriculum incorporates hands-on garden learning and food citizenship education to facilitate food citizenship education as applied to Massachusetts's science and health curriculum framework. Therefore, students will gain new knowledge on food systems while simultaneously reinforcing school year curriculum standards that reduces summer learning loss and contributes to broader understandings of the interconnections between food, society and

the environment (Cooper, Nye, Charlton, Lindsay & Greathouse, 1996; Cooper, Charlton, Valentine & Muhlenbruck, 2000; Donohue & Miller, 2008) .

Tex Box 1, Case Example:

Many of the counselors were inexperienced and lacked skill or enthusiasm in working with children. They were often unaware of the program schedule and would be late bringing the children to the garden. Additionally, many of the counselors felt that they did not have to participate in the garden program, even though their participation could demonstrate model behavior for the children. While the Garden Assistant and I spoke with the staff on numerous occasions regarding better participation and assistance, these problems continued with many of the counselors. While there were a handful of extremely competent and helpful counselors, the few who were unable to provide better assistance took away from the group dynamic and often distracted the children from the day's activity.

My experience piloting the 2015 garden curriculum gave me valuable insight that has informed the current curriculum structure. These experiences have been integrated into the current curriculum as I used prior program knowledge as well as outside research and curriculum framework to develop the 2016 garden curriculum. Understanding the participant and program dynamics have been beneficial in creating a program that is specifically tailored to the SWNIC program. After experiencing the

garden program, I have a further understanding of how the program is run and organized (See Text Box 1, Case Example). While the camp is a valuable resource for the community, the structure of the program was extremely disorganized and it was often difficult to predict which age groups would be participating in the garden program each day. This chaotic and disorganized agenda leads me to believe that a previously prepared curriculum would be beneficial for the future Garden Educator. While the participant groups may vary from day-to-day, the curriculum would provide the Garden Educator with a complete program plan that they could use as a resource to provide some structure and synchronized methodology within the typically disorganized camp structure.

Throughout this process I observed the noticeable differences between age groups that significantly changes the nature of the lessons. While the MA science curriculum specifies standards for K-2nd grade and 3rd-5th grade, MA health curriculum provides broader specifications for K-5th grade. Due to the broad nature of this curriculum framework, I have structured the garden lesson plans so that each lesson addresses MA science and health standards for all K-5th grade requirements. Each lesson plan includes age specific guidelines that tailor the lesson to better suit the specific group. These guidelines are based off of my observations from the 2015 program in which the assistant and I worked with youth in three separate age groups, six-seven (Group 1), eight-nine (Group 2), and ten-eleven (Group 3). In general, Group 1 was unable to grasp scientific concepts related to the material and instead gained more insight through direct experience and observation of real world processes. Group 2 could grasp more of the scientific health and environmental processes; however, their limited attention span significantly impaired their ability to learn. Thus, Group 2 lessons were often short, to the point, and included direct actions of applied learning material. Group 3 was much more aware of larger social and environmental processes related to the lessons. This group could retain information much quicker, and we were able to dedicate equal parts of the lesson to direct study as well as hands-on garden activities to reinforce the material.

While the material gathered through personal qualitative analysis and program experience was an important and necessary component to my research findings and curriculum development, the program lacked quantitative data or applicable post-program evaluation to determine the end results of the program. While the students filled out

surveys at the beginning of the program, these surveys were not adequately completed either before or after the program (See Figure 6). Participants had limited understanding of the survey questions and seemed to randomly choose answers to questions of “how often do you eat fruits and vegetables” or “do you like gardening.” While the original intention was to have the students fill out the survey again at the end of the program, by the final week of the program many of the kids had either gone back to school or could not come to the program due to various family obligations. Therefore, the end results did not accurately convey the extent of the program’s effect on food citizenship education. The 2016 program will introduce an updated survey that students will complete before and after the program (See Figure 7). This survey was modeled off of the Wisconsin Farm to School Evaluation and adapted for use with the Nuestro Huerto and SWNIC program. This survey includes a more comprehensive questionnaire to evaluate student’s agriculture and health knowledge before and after participating in the program. Additionally, this survey will provide Nuestro Huerto with information on the overall program effects and outcomes. This information will be beneficial for improving future programing as well as providing quantitative data for grant applications and funding requirements.

Lastly, while background research on the need for garden programing and hands-on experiential learning provides significant evidence for the need for such a program. This material is based off of research in other communities among children from various demographics and locations. While we can assume these findings apply to Worcester, these findings do not offer a comprehensive look at the specific need among Worcester youth and their understanding of food citizenship in this context specific environment.

However, in general the results of the literature, the Worcester Public School food citizenship curriculum gaps, and personal observation do point to a significant need for this type of educational programming. While these results may not give specific findings, this need should and can be addressed through the application of garden-based learning programs facilitated through the application of this or similar garden curriculum resources.

Partnerships and Project Sustainability

Funding Sustainability

The Nuestro Huerto Education Program is funded as a project of Nuestro Huerto and Nuestro Huerto's fiscal sponsor Worcester Roots Project. Since the program began, it has relied on grants and donations to supply salary support and material costs. Each year Nuestro Huerto has applied for funding from local and national organizations to finance the free SWNIC summer program. I have taken on the grant and funding responsibilities and am currently applying for funding to continue the 2016 program. While Nuestro Huerto has been so far successful in generating funding, the small staff and limited resources have delayed further progress. With hope, Nuestro Huerto and the education program will find more sustainable sources of funding to more securely sustain the program from year-to-year. The limited staff resources have also proven difficult in retaining committed or long-term employees. Nuestro Huerto also hopes to find more permanent staff to follow up with these programs for longer time commitments.

Collaboration in Worcester

The City of Worcester offers numerous opportunities for program extension and collaboration. As the Worcester Food Hub comes to fruition, Worcester has begun to increase opportunities for local food production and distribution through restaurants, food markets, and educational opportunities. These opportunities continue to enhance the food environment in the city and thus increase Worcester's prominence as an innovative community participating in the alternative food movement and AFNs. Additionally, Worcester is home to various active sustainable food non-profits such as the Regional Environmental Council, the Worcester Food and Active Living Policy Council, and other local initiatives of Worcester Roots Project. These groups play an important role in promoting Worcester's commitment to local, sustainable, healthy, and accessible food choices that will reduce food insecure areas around Worcester (Chen, Kaczmarek & Ventola, n.d.). While some of these organizations work on similar issues to Nuestro Huerto, the Nuestro Huerto Education Program is unique in providing summer education programming for younger kids, whereas organizations such as the REC work primarily with Worcester teens. Therefore, these collaborations provide support that does not generate competition for resources or funding.

Worcester is also home to many colleges and universities that could act as further collaborators for further youth opportunities for food citizenship and ecological and social health education. In the past, the SWNIC has collaborated with the College of the Holy Cross' summer work program. Participating students worked as counselors with the SWNIC and in return received work-study payment from the university. These types of partnerships allow the university and students to actively participate in community

engagement initiatives. These initiatives provide students with opportunities and experience as well as summer employment with a local community initiative. Universities throughout Worcester should attempt to participate in similar ways through student support and community involvement. A report by Donohue and Miller (2008) examining the effects of summer learning loss in the New England region identifies the causes and consequences of summer learning loss and possible solutions to improving learning retention. The authors discuss the role of colleges and universities in both providing further research on the extent of summer learning loss as well as providing summer services and educational opportunities to local communities.

Truly capitalizing on the higher education community's increased focus on summer learning might also result in a less direct, but profoundly important, long-term benefit. Through these types of integral roles, New England's colleges and universities would help validate the importance of summer learning, and in the process, help to expand the conversation about where, when, and how learning happens (Donoue & Miller, 2008, p. 20).

Extended Curriculum Application

While the Nuestro Huerto Education Program Curriculum Framework was written for the SWNIC summer program, this curriculum could potentially be used for further community garden-based education programs in Worcester or elsewhere. These lessons could be applied to different community initiatives or community based education programs to incorporate garden based lessons with standard school-year curriculum. While the curriculum is specifically fit for Massachusetts Health Science and Technology/Engineering Curriculum Framework and Massachusetts Comprehensive Health Curriculum Framework, National science and health frameworks follow similar

standards that could appropriately incorporate these garden-lessons. Additionally, while other garden curriculum framework exists, this framework provides week by week themes that provide participants with a broader understanding of food citizenship that does not individually isolate specific topics within the broader theme of food education This curriculum thus provides a more comprehensive strategy for understanding food citizenship that addresses both health and science curriculum from food production to distribution to consumption.

Conclusion

Food. Noun. “Any nutritious substance that people or animals eat or drink, or that plants absorb, in order to maintain life and growth.”

Oxford English Dictionary

The metabolic rift of modern society has created a false perception of abundance and wellbeing, as food is cheap, plentiful, and accessible. This perception is both false and highly problematic, as this food no longer qualifies as a definition in itself. Food as a “nutrition substance” is no longer a given for any food like substance as instead we as consumers are inundated by food like substances that line the grocery stores labeled as “nutritious,” “natural,” “organic,” “low-carb,” “sugar-free,” “fat-free,” “gluten-free,” “paleo,” “vegan,” “Fair-Trade,” “Equal-Exchange,” etc. These products lure consumers into consuming what we have been told to believe as healthy based off of false information and confusing health guidelines. Inaccurate perceptions of food have been intensified through the separation of the ecological and agricultural environment from the social environment. This separation separates food production from the urban environment and places it in the realm of the rural environment. Growing unrest with this detached food

system has sparked the rise of AFNs and alternative food systems that aim to unit the producer and the consumer. These connections have been facilitated through the rise of farmer's markets, slow food restaurants, urban agriculture, community gardens, and food justice organizations. These individuals and groups thus aim to connect the expansive food web through more sustainable and accessible food choices outside of the supermarket aisle.

Food education has been used as a keys strategy to facilitate and improve AFNs and equitable food systems. Food citizenship education contributes comprehensive knowledge on food production, distribution, and consumption to improve environmental and social awareness of the modern agriculture dilemma. These educational opportunities will provide students with new knowledge on what food is, how it is grown, and how they as consumers can make smarter and healthier choices in their own lives. While current school-curriculum addresses many issues closely related to food citizenship such as plant biology, food nutrients, or seasonal changes, these topics are not discussed through a comprehensive strategy to unite each component under a singular theme of food citizenship. Therefore, these subjects must be cohesively taught so that the next generation of consumers can make more social and environmentally friendly food choices that will continue to shape the emerging food movement.

Food citizenship through hands-on and experimental education provides students with practical understanding of the food system. Studies demonstrate the importance of practical garden-based education in providing participants with more applicable and retainable knowledge on science and health inline with food systems and food citizenship education. Worcester Public Schools, like many traditional education systems, fails to

adequately address food citizenship inside or outside the classroom. This project has provided a case for improving food citizenship understanding through a hands-on garden-based summer program at the Camp Street Community Garden in South Worcester. This summer curriculum has been developed to incorporate Massachusetts health and science curriculum framework that can thus reiterate or reinforce school-year curriculum. This program is a valuable opportunities for the low-income youth of the SWNIC who have limited understanding of food citizenship. These lessons will provide students with new knowledge on food citizenship education that will facilitate new environmental consciousness and health cognizance that will ultimately contribute to broader food systems knowledge and progress of a national, sustainable alternative food network.

Appendices

Figure 1.

Nuestro Huerto Education Program: Curriculum Framework for the South Worcester Neighborhood Improvement Center's 2016 Summer Camp

The purpose of this course is to introduce students to food system and food citizenship through experimental garden-based learning opportunities. This curriculum is based off of the Massachusetts Department of Education science and health curriculum learning standards (LS). These standards include the 2006 Science and Technology/Engineering Curriculum Framework and the 1999 Massachusetts Comprehensive Health Curriculum Framework.

This syllabus includes 15 one-hour garden lessons that will be offered to the South Worcester Neighborhood Improvement Center (SWNIC) for the 2016 Nuestro Huerto Summer Education Program. Each lesson includes a garden lesson that fits into the MA health or science curriculum framework for PreK-5th grade students. The garden lessons should be repeated for each age group (ages 6-7, 8-9, and 9-10) throughout the five-week camp. Due to the nature of the camp, such as lack of consistent age groups and regularly scheduled participation, these lessons can be tailored to fit specific age groups depending on the given day. Additionally, because the children participate in other programming throughout the five weeks, the Garden Educator may be unable to work with the children on all three lessons in a given week. Therefore, it will be up to the Garden Educator's discretion whether it is necessary to eliminate lessons or combine lessons to fit into the SWNIC program structure.

Week 1, Introduction to the Garden

Day 1: What's Growing in the Garden?

MA Science Standard

- Earth and Space Sciences: PreK-2nd LS 1 and 3rd-5th LS 5
- Life Sciences (Biology): PeK-2nd LS 1

Day 2: From Seed to Stem

MA Science Standard

- Life Science (Biology): PreK-2nd LS 3 and 3rd-5th LS 1, 2, 3, 5, 6, 9

Day 3: Planting Our Community Garden

MA Science Standard

- Life Science (Biology): PreK-2nd LS 1 and 3rd-5th LS 1, 2, 3, 9

Week 2, What Plants Need to Grow

Day 4: Soil and Compost

MA Science Standard

- Earth and Space Science: PreK-2nd LS 1 and 3rd-5th LS 4, 5
- Life Science (Biology): PreK-2nd LS 3, 7 and 3rd-5th LS 3, 7, 10

Day 5: Bed Bugs

MA Science Standard

- Earth and Space Science: PreK-2nd LS 1 and 3rd-5th LS 4, 5
- Life Science (Biology): PreK-2nd LS 1 and 3rd-5th LS 2, 6, 7

Day 6: Helping Our Plants Grow

MA Science Standard

- Earth and Space Science: PreK-2nd LS 3, 4 and 3rd-5th LS 3, 6, 7, 10, 14
- Life Science (Biology): PreK-2nd LS 1 and 3rd-5th LS 7, 9, 10

Week 3, Community Land and Space

Day 7: Exploring Our Regions History

MA Science Standard

- Life Science (Biology): 3rd-5th LS 6, 7

MA Health Standard

- Physical Health Strand: PreK-5th LS 3.5

Day 8: Gardening in an Urban Environment

MA Science Standard

- Earth and Space Science: 3rd-5th LS 5
- Life Science (Biology): 3rd-5th LS 5, 7

MA Health Standard

- Personal and Community Health Strand: PreK-5th LS 14.1

Day 9: Community Engagement and Environmental Stewardship

MA Health Standard

- Physical Health Strand: PreK-5th LS 3.7
- Personal and Community Health Strand: PreK-5th LS 13.1, 13.2, 14.1, 14.2

Week 4, Understanding Agriculture System

Day 10: Local and Regional Food Systems

MA Science Standard

- Life Science (Biology): PreK-2nd LS 7 and 3rd-5th LS 7, 9

MA Health Standard

- Physical Health Strand: PreL-5th LS 3.5, 3.7
- Personal and Community Health Strand: PreK-2nd LS 13.2, 14.1, 14.2

Day 11: Visit to Nuestro Huerto Farm

MA Science Standard

- Life Science (Biology): PreK-2nd LS 1 and 3rd-5th LS 1, 2, 5, 10

MA Health Standard

- Physical Health Strand: PreL-5th LS 3.5, 3.7
- Personal and Community Health Strand: PreK-2nd LS 13.1, 13.2

Day 12: Connecting the Food System

MA Science Standard

- Life Science (Biology): PreK-2nd LS 3 and 3rd-5th LS 3, 10

MA Health Standard

- Physical Health Strand: PreL-5th LS 3.5,
- Personal and Community Health Strand: PreK-2nd LS 13.1, 13.2, 14.1

Week 5: Harvesting for Health

Day 13: Harvest Salad

MA Health Standard

- Physical Health Strand: PreK-5th LS 3.1, 3.2, 3.3, 3.4, 3.6, 3.7
- Personal and Community Health Strand: PreK-2nd LS 12.2, 12.3, 12.5,

Day 14: Super Green Smoothies

MA Health Standard

- Physical Health Strand: PreK-5th LS 3.1, 3.2, 3.3, 3.4, 3.6, 3.7
- Personal and Community Health Strand: PreK-2nd LS 12.2, 12.3, 12.5,

Day 15: Growing for a Healthy Planet + Healthy Bodies

MA Science and Health Standard Review

Figure 2. Example Lesson

Nuestro Huerto Education Program Week 1, Lesson 2: Seed to Stem

Objectives:

- Understand the basic requirements for plant growth
- Understand basic processes of germination
- Understand how to start seeds without soil (activity 1) and how to plant seeds directly into soil (activity 2)

Massachusetts Learning Standards:

MA Science Standard

Life Science (Biology): PreK-2nd LS 3 and 3rd-5th LS 1, 2, 3, 5, 6, 9

Materials:

Printed Diagram (see attachment)

Seeds in labeled open containers

Plastic bags

Paper towels

Seeds

1 Water bucket

2 buckets of soil

Recycled container pots (milk jugs, juice containers, etc. with holes in bottom)

3 Watering cans

Marker to label bags

Journals

Pencils

Preparation:

1. Review information on plant growth and seed germination. For more information, read the following: <http://tomatosphere.org/teachers/guide/principal-investigation/seeds-germination> and <http://growing-minds.org/documents/watering-the-garden.pdf>.
2. Prepare the planting materials in advance: collect recycled containers and make drainage holes in the bottom of each container.
3. Before the lesson, set up stations for the paper towel germinating activity and the pot planting activity.

Lesson:

This lesson will teach the children about the processes of plant growth and germination. This lesson will allow students to understand how water, sunlight, and nutrients contribute to the processes of plant growth. This lesson will use hands-on learning to engage children in physical experimentation with planting with and without soil. This material will contribute to the participants broader understanding of plant growth that they will experience and observe throughout the next few weeks.

Garden Activity:

Introduce the day's lesson and explain that today they will be learning about the processes of plant growth as plants grow from seed, to seedling, to full grown plants. While introducing the topic, assess the children's understanding by posing questions such as "what does germination mean?" and "what do seeds need to germinate?" Explain how plants need a combination of water, light, and nutrients to grow; however, because water is the first requirement for plant growth, seeds can germinate without soil nutrients. Make sure the children understand these concepts and can list the requirements for plant growth before moving on to the next activity.

Pass around labeled seed containers to demonstrate differences in seed type and size. Show students corn cobs and see if they can guess what they are. Use this activity so demonstrate how many of the seeds we plant in the ground to produce food are the same seeds that we eat.

Now that the children have a better understanding of seed and plant growth processes, they will have the opportunity to experiment with different planting techniques. Explain how we will be germinating our own seeds with and without soil. Ask the children if they have ever germinated seeds in a plastic bag (some of the children may have already done this activity in school and can help demonstrate the activity). Explain and demonstrate the activity by taking a paper towel, dipping it into the bucket of water, folding it around the bean seed, and sealing it in the plastic bag. Label the bag and leave it in the sun for a few days to germinate. Then, pass around the bean seed germination supplies: bean seeds, paper towels, and plastic bags and have the children each start their own seeds. These seeds may be planted in the garden the following week.

Next, explain that in order for plants to fully grow to maturity seeds need water, light, and *soil*. Briefly explain how soil has many beneficial nutrients that help our plants grow. This lesson will be expanded upon later in the week through further activities on soil nutrients and composting. Pass around the labeled containers and have the children fill their containers with soil. Demonstrate how to plant seeds based on the instructions specific to the seeds they are planting. After each participant has planted their seeds, designate watering groups who will be in charge of watering the plants on specific days of the week.

Explain how each group will get a chance to water the plants and how it is important that the plants receive enough, but not too much, water each day.

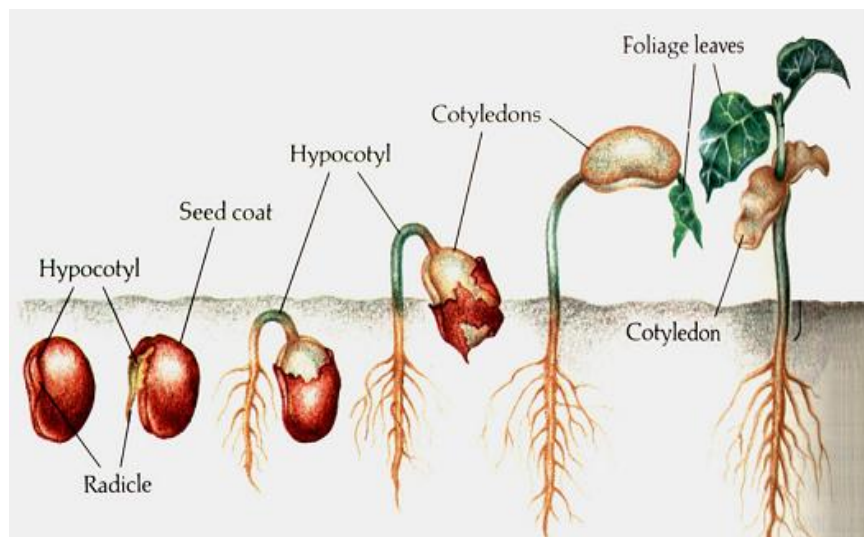
Pass around the journals, and have the children write a few sentences on the day's activity. Provide a journal prompt such as "what do plants need to grow?" or "how and what did you plant in your container?" Ask children to share with the group something they wrote in their journal. Use this as an opportunity to review the lesson and reiterate the processes of plant growth and different planting techniques covered in the day's lesson.

Lesson Modification:

The younger children will have more difficulty understanding the germination activity. Simplify the lesson by focusing on the experiential part of the lesson and less on the scientific processes of seed germination. Additionally, the younger children will require more help with activity. Use counselor support to instruct the children and provide hands-on help to plant their seeds.

The older children will be more familiar with this activity (many of them may have done something similar in school!) Pose questions to stretch their memory and see what they remember from their school lessons. Review more scientific details and biological transformations of seeds and plant growth using the attached diagram.

Attachments:



<http://dsign.top/bean-seed-germination-diagram.html>

Figure 3.
Massachusetts Science and Garden Curriculum Framework:

Earth and Space Science					Application for Summer Curriculum
Curriculum Topic	Learning Standard	Current Extension Activity			Week 1, Day 1: What's Growing in the Garden? Week 2, Day 4: Soil and Compost Week 2, Day 5: Bed Bugs
PreK-2nd	Earth's Materials	1. Recognize that water, rocks, soil, and living organisms are found on the earth's surface.	Walk around the playground observing and discussing where water, rocks, soil, and living organisms are found.		
	The Weather	3. Describe the weather changes from day to day and over the seasons.	Keep a class weather chart indicating daily temperature, how windy it is, which direction wind is blowing (use visual clues), and kind of precipitation, if any.		Week 2, Day 6: Helping Our Plants Grow
	The Sun as a Source of Light and Heat	4. Recognize that the sun supplies heat and light to the earth and is necessary for life.	Record the time of day when the sun shines in different school locations and note patterns.		Week 2, Day 6: Helping Our Plants Grow
	Periodic Phenomena	3. Identify some events around us that have repeating patterns, including the seasons of the year, day and night.	Make a list of things seen outdoors and in the sky during the day. Make another list of things seen outdoors and in the sky at night. Discuss the differences between the day and night lists.		Week 2, Day 6: Helping Our Plants Grow
	Soil	4. Explain and give examples of the ways in which soil is formed (the weathering of rock by water and wind and from the decomposition of plant and animal remains).	Observe sand with a hand lens. Note how particles resemble minerals. Observe topsoil with a hand lens. Look for fragments of organisms. Note differences in color, texture, odor, and clumping due to organic components vs. pure sand. Mix topsoil and sand together in various proportions to represent samples of types of soils.		Week 2, Day 4: Soil and Compost Week 2, Day 5: Bed Bugs
	Soil	5. Recognize and discuss the different properties of soil, including color, texture (size of particles), the ability to retain water, and the ability to support the growth of plants.	Design an experiment to find out if different soil samples retain different amounts of water. Explain how the properties of the particles affect the large-scale properties of the soil like water retention and speed of water flow. Discuss how a soil's water retention affects the animals and plants that live in it.		Week 1, Day 1: What's Growing in the Garden? Week 2, Day 4: Soil and Compost Week 2, Day 5: Bed Bugs Week 3, Day 8: Gardening in an Urban Environment
	Weather	6. Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time.	Use a collection of classical (not digital) weather instruments, including thermometer, barometer, rain gauge, hygrometer, and anemometer, that clearly show the physical principle that makes them work. Note: A "homemade" instrument is often too inaccurate and unreliable to be a good weather teaching aid by itself. However, when used in combination with a working instrument of similar simple design, it can help students grasp both an important physical concept and its relevance to weather.		Week 2, Day 6: Helping Our Plants Grow
	Weather	7. Distinguish among the various forms of precipitation (rain, snow, sleet, and hail), making connections to the weather in a particular place and time.	Measure various forms of precipitation. Bring a measured sample of snow into the classroom, allow it to melt, and compare the amount of water that results with the original measurement.		Week 2, Day 6: Helping Our Plants Grow
	The Water Cycle	10. Describe how water on earth cycles in different forms and in different locations, including underground and in the atmosphere.	Draw a diagram of the water cycle. Label evaporation, condensation, and precipitation. Explain what happens during each process.		Week 2, Day 6: Helping Our Plants Grow
	The Earth in the Solar System	14. Recognize that the earth revolves around (orbits) the sun in a year's time and that the earth rotates on its axis once approximately every 24 hours. Make connections between the rotation of the earth and day/night, and the apparent movement of the sun, moon, and stars across the sky.	Observe and discuss changes in length and direction of shadows during the course of a day.		Week 2, Day 6: Helping Our Plants Grow
3rd-5th					

Life Science (Biology)			
Curriculum Topic	Learning Standard	Current Extension Activity	Application for Summer Curriculum
PreK-2nd	Characteristics of Living Things	1. Recognize that animals (including humans) and plants are living things that grow, reproduce, and need food, air, and water.	Week 1, Day 1: What's Growing in the Garden? Week 1, Day 3: Planting Our Community Garden Week 2, Day 5: Bed Bugs Week 2, Day 6: Helping Our Plants Grow Week 3, Day 11: Visit to Nuestro Huerto Farm
	Characteristics of Living Things	3. Recognize that plants and animals have life cycles, and that life cycles vary for different living things.	Week 1, Day 2: From Seed to Stem Week 2, Day 4: Soil and Compost Week 4, Day 12: Connecting the Food System
	Living Things and Their Environment	7. Recognize changes in appearance that animals and plants go through as the seasons change.	Week 2, Day 4: Soil and Compost Week 4, Day 10: Local and Regional Food Systems
	Characteristics of Plants and Animals	1. Classify plants and animals according to the physical characteristics that they share.	Week 1, Day 2: From Seed to Stem Week 1, Day 3: Planting Our Community Garden Week 3, Day 11: Visit to Nuestro Huerto Farm
	Structures and Functions	2. Identify the structures in plants (leaves, roots, flowers, stem, bark, wood) that are responsible for food production, support, water transport, reproduction, growth, and protection.	Week 1, Day 2: From Seed to Stem Week 1, Day 3: Planting Our Community Garden Week 2, Day 5: Bed Bugs Week 3, Day 11: Visit to Nuestro Huerto Farm
	Structures and Functions	3. Recognize that plants and animals go through predictable life cycles that include birth, growth, development, reproduction, and death.	Week 1, Day 2: From Seed to Stem Week 1, Day 3: Planting Our Community Garden Week 2, Day 4: Soil and Compost Week 4, Day 12: Connecting the Food System
	Structures and Functions	5. Differentiate between observed characteristics of plants and animals that are fully inherited (e.g., color of flower, shape of leaves, color of eyes, number of appendages) and characteristics that are affected by the climate or environment (e.g., browning of leaves due to too much sun, language spoken).	Week 1, Day 2: From Seed to Stem Week 1, Day 3: Planting Our Community Garden Week 2, Day 4: Soil and Compost Week 4, Day 12: Connecting the Food System
	Structures and Functions	6. Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive, e.g., shape of beak or feet, placement of eyes on head, length of neck, shape of teeth, color.	Week 1, Day 2: From Seed to Stem Week 3, Day 8: Gardening in an Urban Environment Week 3, Day 11: Visit to Nuestro Huerto Farm
	Adaptions of Living Things	7. Give examples of how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration).	Week 1, Day 2: From Seed to Stem Week 2, Day 5: Bed Bugs Week 3, Day 7: Exploring Our Regions History
	Adaptions of Living Things	9. Recognize plant behaviors, such as the way seedlings' stems grow toward light and their roots grow downward in response to gravity. Recognize that many plants and animals can survive harsh environments because of seasonal behaviors, e.g., in winter, some trees shed leaves, some animals hibernate, and other animals migrate.	Week 2, Day 4: Soil and Compost Week 2, Day 5: Bed Bugs Week 3, Day 6: Helping Our Plants Grow Week 3, Day 7: Exploring Our Regions History Week 4, Day 10: Local and Regional Food Systems
3rd-5th	Adaptions of Living Things	Set a germinating bean in a glass filled with water next to an asymmetric source of light. Allow the root and stem to grow a few inches. Rotate the bean so that the roots are now touching the water at an angle and the stem is away from the light source. Observe how the root system and stem respond to this change by changing their direction of growth.	Week 1, Day 2: From Seed to Stem Week 1, Day 3: Planting Our Community Garden Week 2, Day 6: Helping Our Plants Grow Week 4, Day 10: Local and Regional Food Systems
	Energy and Living Things	10. Describe how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain from producers (plants) to consumers to decomposers.	Week 2, Day 4: Soil and Compost Week 2, Day 6: Helping Our Plants Grow Week 3, Day 11: Visit to Nuestro Huerto Farm Week 4, Day 12: Connecting the Food System

Figure 4.

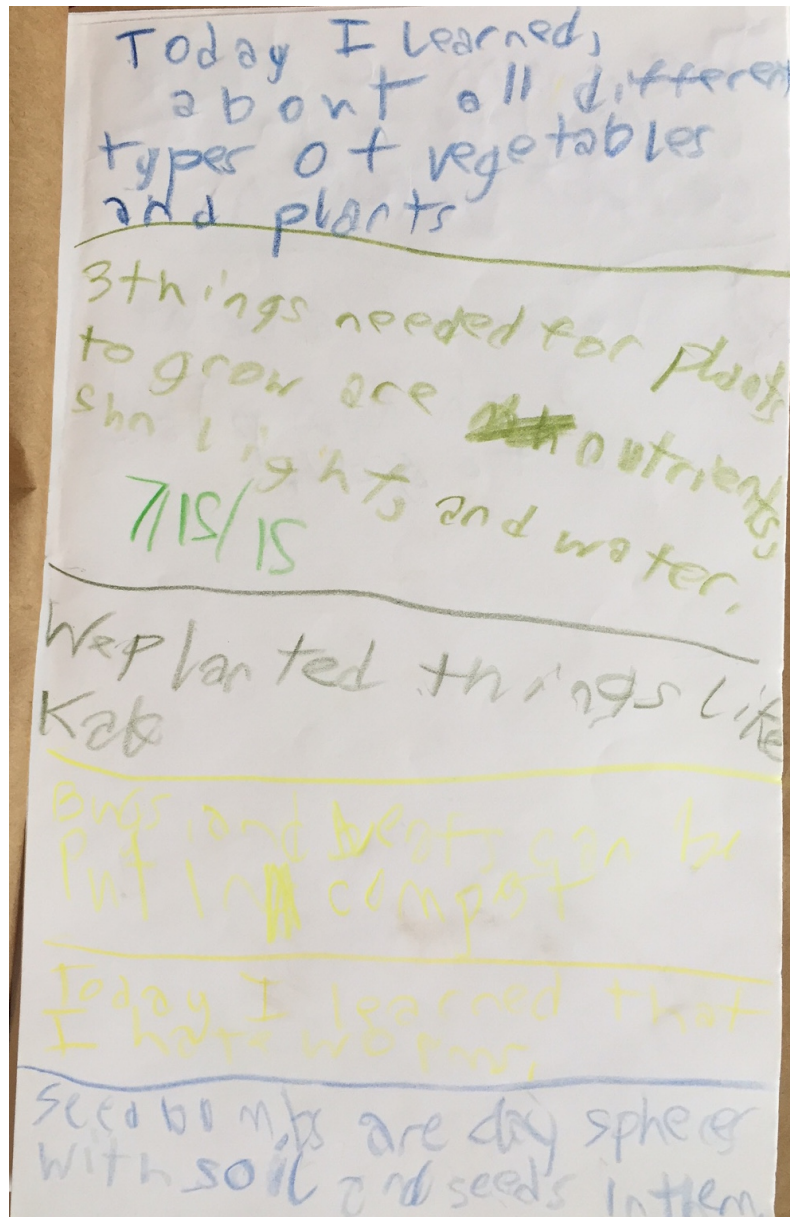
Massachusetts Health and Garden Curriculum Framework:

Physical Health Strand				
Nutrition				
Learning Standard	Learning Standard	Current Extension Activity	Application for Summer Curriculum	
Nutrition	3.1 Identify the key nutrients in food that support healthy body systems.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	
Nutrition	3.2 Use the USDA Food Guide Pyramid and its three major concepts of balance, variety, and moderation to plan healthy meals and snacks.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	
Nutrition	3.3 Recognize hunger and satiety cues and how to make food decisions based upon these cues.	Sponsor a potluck lunch in the class and ask students to select and eat servings one at a time so that they eat slowly until their appetite is satisfied. Ask them to pay attention to their feelings of hunger and satiety. Students discuss their experiences.	Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	
Nutrition	3.4 Identify heredity, diet, and physical activity as key factors in body shape and size.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	
Safe and Adequate Food Supply	3.5 Identify the connection between food served in the home with regional food production.	Students interview a person in the home who prepares food to determine how food choices change according to season.	Week 3, Day 7: Exploring Our Regions History Week 4, Day 10: Local and Regional Food Systems Week 4, Day 11: Visit to Nuestro Huerto Farm Week 4, Day 12: Connecting the Food System	
Safe and Adequate Food Supply	3.6 Describe personal hygiene and safety measures used in preparing foods.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	
Social Influences of Food	3.7 Describe how food choices are influenced by availability, individual and family preferences, media, and background, and identify healthy foods within various social groups.		Week 3, Day 9: Community Engagement and Environmental Stewardship Week 4, Day 10: Local and Regional Food Systems Week 4, Day 11: Visit to Nuestro Huerto Farm Week 4, Day 12: Connecting the Food System Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies	

Personal and Community Health Strand				
Consumer Health and Resource Management				
PreK-5th	Learning Standard	Learning Standard	Current Extension Activity	Application for Summer Curriculum
	Health Care Study	12.2 Interpret the symbols and information provided on labels for health care products and food products.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies
	Resource Management Practices	12.3 Identify advertising techniques.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies
	Resource Management Practices	12.5 Name and weigh criteria for selecting a consumer product and evaluate the product's safety and health aspects.		Week 5, Day 13: Harvest Salad Week 5, Day 14: Super Green Smoothies
Ecological Health				
PreK-5th	Learning Standard	Learning Standard	Current Extension Activity	Application for Summer Curriculum
	Study of Interdependence	13.1 Describe types of natural resources and their connection with health.		Week 3, Day 9: Community Engagement and Environmental Stewardship Week 4, Day 11: Visit to Nuestro Huerto Farm Week 4, Day 12: Connecting the Food System
	Study of Interdependence	13.2 Describe how business industry and individuals can work cooperatively to solve ecological health problems, such as conserving natural resources and decreasing pollution.	Working with family volunteers, students clean up school grounds and plant flowers and other plants that help clean the air (such as spider plant or peace lily). Take before and after pictures and display.	Week 3, Day 9: Community Engagement and Environmental Stewardship Week 4, Day 10: Local and Regional Food Systems Week 4, Day 11: Visit to Nuestro Huerto Farm Week 4, Day 12: Connecting the Food System
	Learning Standard	Learning Standard	Current Extension Activity	Application for Summer Curriculum
PreK-5th	Learning Standard	Learning Standard	Current Extension Activity	Application for Summer Curriculum
	School and Community Efforts	14.1 List the jobs carried out by people at school and in the community that support health and success in school.	Invite community helpers to speak about the contribution of their occupation to community and/or public health and answer questions from students.	Week 3, Day 9: Community Engagement and Environmental Stewardship Week 4, Day 10: Local and Regional Food Systems Week 4, Day 12: Connecting the Food System
	Social Factors	14.2 Identify ways the physical environment is related to individual and community health.	Working with family volunteers, students clean up school grounds and plant flowers and other plants that help clean the air (such as spider plant or peace lily). Take before and after pictures and display.	Week 3, Day 9: Community Engagement and Environmental Stewardship Week 4, Day 10: Local and Regional Food Systems Week 4, Day 11: Visit to Nuestro Huerto Farm

Figure 5.

Participant Journal Entries:



Today I learned..... 9/14/19
that summer squash have
squash blossoms. They are
also in the family of
zucchini and cucumbers.
That is what I learned
mostly today!

We learned
about vermon compost
and worms help
soil with the
poop

Figure 6.

2015 Program Surveys:

How much experience do you have gardening?
1 2 3 4 5 6 7 8 9 10
(None) (A lot)

How interested are you in gardening?
1 2 3 4 5 6 7 8 9 10
(Not at all) (A lot)

Do you like eating vegetables and fruits?
1 2 3 4 5 6 7 8 9 10
(No!) (Yes!)

Do you know how to cook? (Don't include reheating food or frozen/prepared foods.)
1 2 3 4 5 6 7 8 9 10
(No!) (Yes!)

How much experience do you have gardening?
1 2 3 4 5 6 7 8 9 10
(None) (A lot)

How interested are you in gardening?
1 2 3 4 5 6 7 8 9 10
(Not at all) (A lot)

Do you like eating vegetables and fruits?
1 2 3 4 5 6 7 8 9 10
(No!) (Yes!)

Do you know how to cook? (Don't include reheating food or frozen/prepared foods.)
1 2 3 4 5 6 7 8 9 10
(No!) (Yes!)

Figure 7:
Nuestro Huerto Education Program
2016 Participant Survey

We want to hear what you think about fruits and vegetables and how much you know about gardening - thank you for helping us!

Please answer the questions and tell us what you think. If you have any questions, please ask a counselor or one of the Garden Educators!

Please tell us how you feel about fruit:

	a lot	a little	not very much	not at all
1. How much do you like fruit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. How much do you like tasting new fruits?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. How often do you try new fruits?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tell us how you feel about vegetables?

	a lot	a little	not very much	not at all
4. How much do you like vegetables?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. How much do you like new vegetables?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. How often do you try new vegetable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please tell us how much you know about farming and gardening?

8. How many times in your life have you been to a farm or garden?

- ☐ Never
- ☐ 1 time
- ☐ 2 times
- ☐ 3 times
- ☐ 4 times

9. Have you ever worked in a garden?

- ☐ Yes, at school
- ☐ Yes, at home
- ☐ Yes, at SWNIC
- ☐ No

10. How much do you like to gardening?

- ☐ A lot

- ☐ A little
- ☐ Not very much
- ☐ Not at all

How much do you know about growing fruits and vegetables?

11. How do tomatoes grow? Please check one.

- ☐ As plants
- ☐ As animals
- ☐ As minerals
- ☐ Something else
- ☐ I don't know

12. What part of a plant is a carrot? Please check one.

- ☐ Leaf
- ☐ Root
- ☐ Stem
- ☐ Flower
- ☐ I don't know

13. Do insects play an important role in growing plants?

- ☐ Yes
- ☐ No
- ☐ I don't know

14. Do TOMATOES grow in Massachusetts?

- ☐ Yes
- ☐ No
- ☐ I don't know

15. Does SQUASH grow in Massachusetts?

- ☐ Yes
- ☐ No
- ☐ I don't know

16. Do BANANAS grow in Massachusetts?

- ☐ Yes
- ☐ No
- ☐ I don't know

17. What food group does the pear belong to? Please check one.

- ☐ Dairy

- ☐ Fruits & Vegetables
- ☐ Meat
- ☐ Grains

How much do you know about healthy eating?

18. Why do I need to eat food?

- ☐ I need food for energy and to grow.
- ☐ I need food ONLY because it tastes good.
- ☐ I don't need food.
- ☐ I don't know

19. Healthy eating is:

- ☐ Eating fruits but not vegetables.
- ☐ Not eating fruits or vegetables.
- ☐ Eating both fruits and vegetables.
- ☐ I don't know.

20. The foods that I eat for meals and snacks are healthy. (Choose one.)

- ☐ Yes, all of the time
- ☐ Yes, sometimes
- ☐ No
- ☐ I don't know

21. How likely are you to eat fresh fruit instead of candy? (Choose one.)

- ☐ Not likely
- ☐ Likely
- ☐ Very Likely

Think about all the foods you ate or drank yesterday. Try to remember everything you ate for breakfast, lunch, dinner or snack and check all that apply.

	Did you eat or drink it yesterday?	How much did you eat?
67. Apples, bananas, or oranges	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> ½ <input type="checkbox"/> 1 <input type="checkbox"/> 2
68. Applesauce, fruit cocktail	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
69. Any other fruit, like strawberries, grapes	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
70. French fries, hash browns, tater tots	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
71. Other potatoes, like mashed or boiled	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
72. Ketchup or salsa	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
73. Lettuce salad	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
74. Tomatoes, including on salad	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> ¼ tomato <input type="checkbox"/> ½ tomato <input type="checkbox"/> 1 tomato
75. Green beans or peas	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
76. Other vegetables, like corn, carrots, greens, broccoli	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
77. Vegetable soup, tomato soup, any soup or stew with vegetables in it	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
78. Chili beans, pinto beans, black beans, including in burritos	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot
79. Refried beans	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> A little <input type="checkbox"/> Some <input type="checkbox"/> A lot

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